



Student Number: .....

**2005**

**PRELIMINARY**

Sample Examination Paper

# GENERAL MATHEMATICS

## General Instructions

- Reading Time – 5 minutes
- Working Time – 2.5 hours
- Write using blue or black pen
- Write your student number at the top of this page
- Calculators may be used
- A formulae sheet is provided at the back of this paper

**Total marks - 100**

## Section I

**22 marks**

- Attempt Questions 1–22
- Allow about 30 minutes for this section

## Section II

**78 marks**

- Attempt Questions 23–28
- Allow about 2 hours for this section

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## Section I

### Attempt Questions 1–22

Allow about 30 minutes for this section

Use the multiple-choice answer sheet.

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

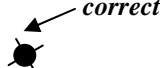
**Sample:**  $2 + 8 =$  (A) 2 (B) 4 (C) 8 (D) 10

(A) ☐ (B) ☐ (C) ☐ (D) ☒

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

(A) ☐ (B) ☒ (C) ☐ (D) ☒

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word **correct** and drawing an arrow as follows.

(A) ☐ (B) ☒ (C) ☐ (D) ☒ 

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## Section I

22 marks

Attempt Questions 1–22

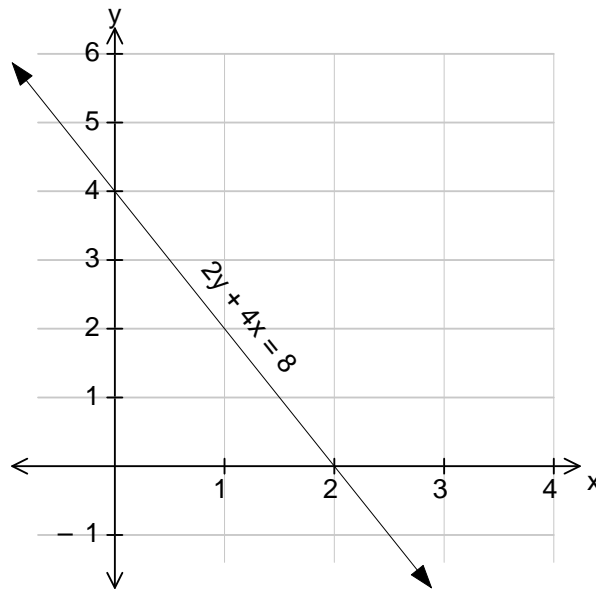
Allow about 30 minutes for this section

Use the multiple choice answer sheet

1 The probability of getting a 5 on an ordinary fair dice is

- A  $\frac{1}{6}$
- B  $\frac{1}{5}$
- C  $\frac{1}{2}$
- D 1

2 Allan drew the graph of the line  $2y + 4x = 8$ .



What is the gradient and y-intercept of the line?

- A gradient =  $-2$ , y-intercept =  $-4$
- B gradient =  $2$ , y-intercept =  $4$
- C gradient =  $2$ , y-intercept =  $-4$
- D gradient =  $-2$ , y-intercept =  $4$

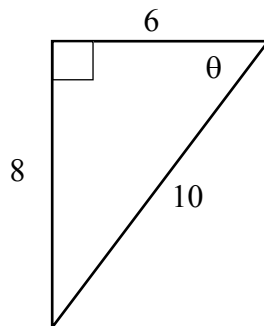
3 If  $I = \frac{E}{R + r}$ ,  $E = 42$ ,  $R = 5$  and  $r = 2$ , what is the value of  $I$ ?

- A -2
- B 4
- C 6
- D 10.4

4 Which term best describes the amount of money left in a person's wage when ALL deductions are taken away?

- A wage
- B salary
- C net
- D gross

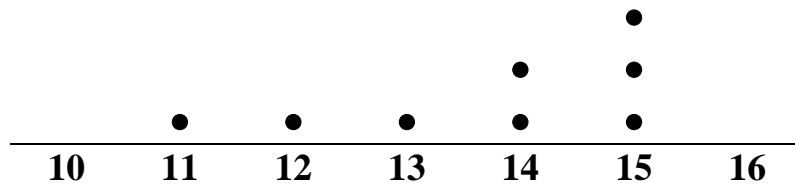
5 What is the correct expression for  $\sin\theta$  in this triangle?



**NOT TO  
SCALE**

- A  $\frac{6}{10}$
- B  $\frac{8}{10}$
- C  $\frac{8}{6}$
- D  $\frac{10}{8}$

Use the dot diagram below to answer Questions 6 and 7.



- 6 What is the range of the set of scores?
- A 3
  - B 4
  - C 5
  - D 6
- 7 What are the median and the mode of the set of scores?
- A Median 3, Mode 11
  - B Median 14, Mode 12
  - C Median 15, Mode 13
  - D Median 14, Mode 15
- 8 A car is advertised for sale at \$5300. Brenda is offered a 12% discount. What is the discounted price of the car?
- A \$636
  - B \$4620
  - C \$4664
  - D \$5288

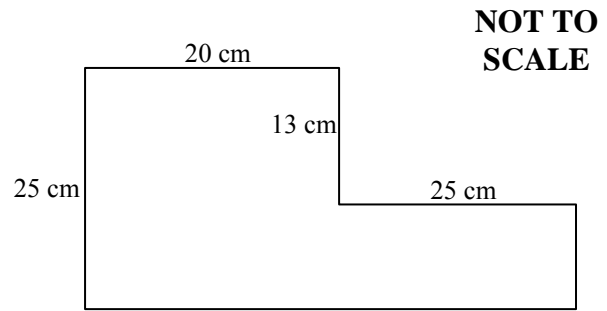
9 Which of the following will calculate the area of the shape below?

A  $(20 \times 13 + 25 \times 25) \text{ cm}^2$

B  $(25 \times 25 - 20 \times 13) \text{ cm}^2$

C  $(45 \times 12 + 45 \times 13) \text{ cm}^2$

D  $(45 \times 25 - 25 \times 13) \text{ cm}^2$



10  $10x - 2(2x - 4) =$

A  $8 - 6x$

B  $8 + 6x$

C  $6x - 4$

D  $6x - 8$

11 Ahmad receives \$68 500 p.a. How much does he receive each fortnight?

A \$187.67

B \$1 317.31

C \$2 634.62

D \$5 708.33

12 A council charges ratepayers 1.9 cents in the \$1 on the unimproved value of their properties.

How much would be paid in rates by a householder whose property has an unimproved value of \$150 000?

A \$150

B \$2850

C \$78 947

D \$285 000

- 13** Ngoc wrote the following lines of working to solve the equation:

$$3x + 5 = 16$$

Line 1  $3x = 16 + 5$

Line 2  $3x = 21$

Line 3  $x = \frac{21}{3}$

Line 4  $x = 7$

In which line did she make an error?

- A Line 1
  - B Line 2
  - C Line 3
  - D Line 4
- 14** The diameter of the hydrogen atom is approximately 0.000 000 000 025 4 metres.

This distance expressed in scientific notation is

- A  $25.4 \times 10^{-11}$
  - B  $2.54 \times 10^{11}$
  - C  $2.54 \times 10^{10}$
  - D  $2.54 \times 10^{-11}$
- 15** The numbers 1, 2, 3 and 4 are written on 4 cards, one number on each card. The cards are shuffled and then placed side by side to form a 4-digit number.

The number of 4-digit numbers possible is

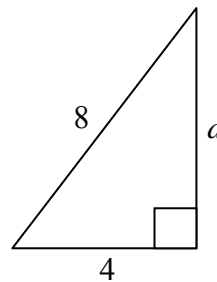
- A 4
- B 10
- C 16
- D 24

- 16** The interest earned on \$900 invested for 2 years at 10% p.a. is

A \$45  
B \$90  
C \$150  
D \$180

- 17** The length,  $d$ , in the triangle opposite, correct to 2 decimal places, is

A 2.15  
B 4.00  
C 6.93  
D 8.94



**NOT TO  
SCALE**

- 18** David earns \$8.90 per hour for a 6 hour shift at the local supermarket. His friend Karen works at the same store and receives \$5.50 per hour plus a uniform allowance of \$4.50 for a 6 hour shift.

Which of the following statements is correct?

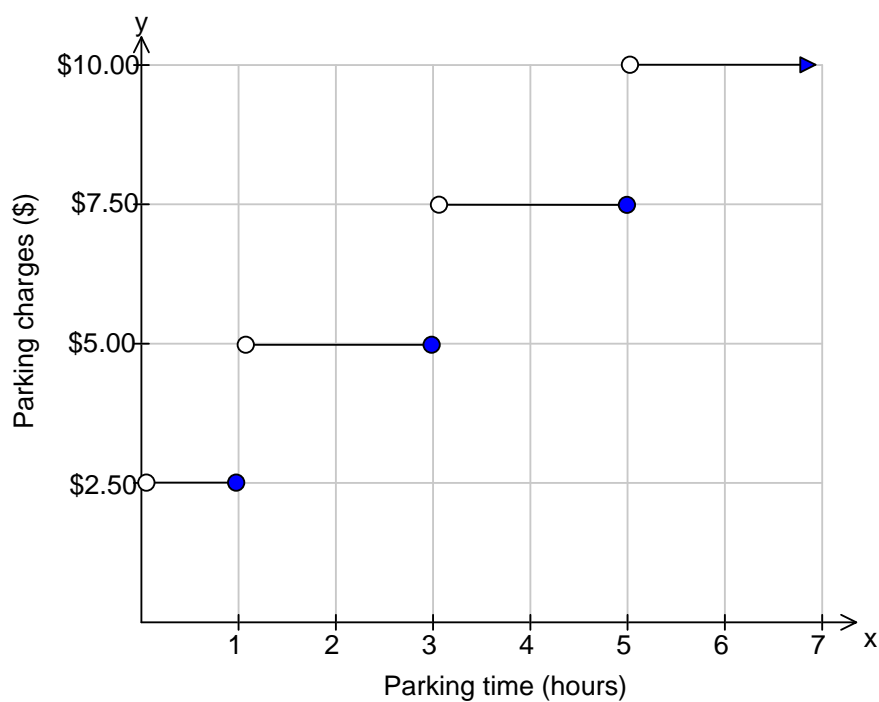
A They will receive the same amount of money for the shift.  
B David receives \$15.90 more than Karen for the shift.  
C Karen receives \$37.50 more than David for the shift.  
D Karen receives \$6.60 more than David for the shift.

- 19** From the following investigations determine which is an example of quantitative-discrete data?

A Names of girls at your High School.  
B Number of cars stopping at a set of traffic lights in 1 day.  
C Favourite TV shows.  
D Weights of babies.



- 20** The step graph shows parking charges at a parking station.



What is the cost for parking for 3 hours?

- A     \$2.50
- B     \$5
- C     \$7.50
- D     \$10
- 21** Which point lies on the line  $y = \frac{2x + 5}{4}$  ?

- A     (0, 2)
- B     (2, 5)
- C     (2, 0)
- D     (1.5, 2)

**22** A map has a scale of 1 : 100 000.

The distance between 2 towns on the map is 8.4 cm. How far apart are the 2 towns?

A 3.6 km

B 8.4 km

C 84 km

D 840 km

**End of Section I**

## Section II

78 marks

### Attempt Questions 23–28

Allow about 2 hours for this section

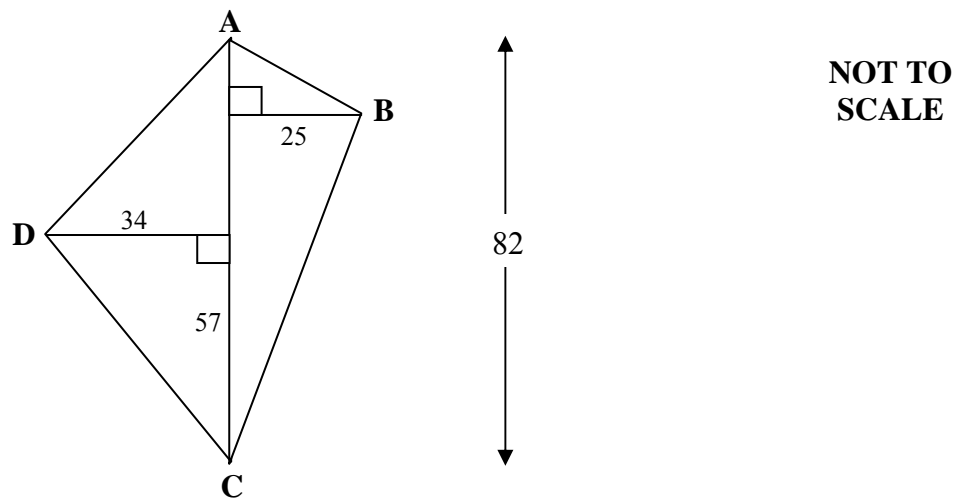
Answer each question on a separate sheet of paper, clearly labelled with your student number.

All necessary working should be shown in every question.

Marks

#### Question 23 (13 marks) Use a SEPARATE sheet of paper.

- (a) The field diagram below shows the shape of the local park.  
All measurements are in metres.



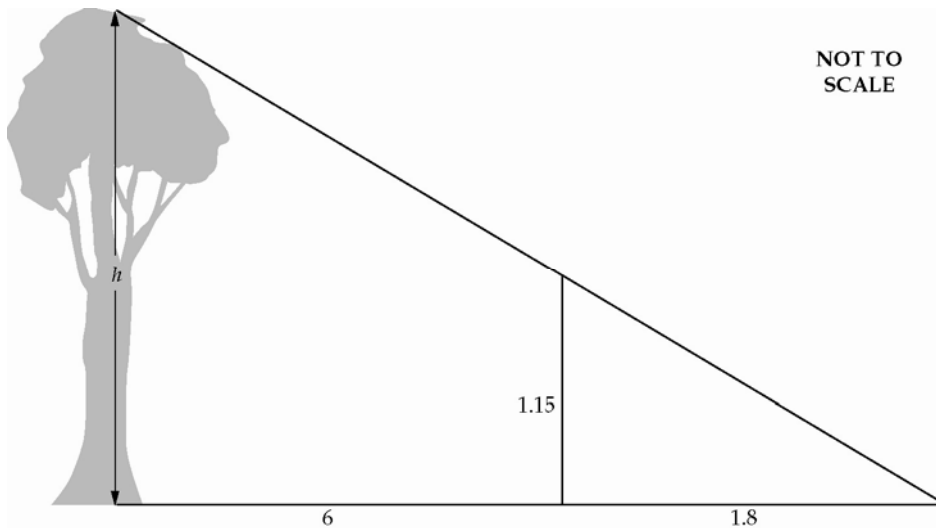
- |       |  |   |
|-------|--|---|
| (i)   | Show that the area of the park is 2 419 square metres.   | 2 |
| (ii)  | A fence is to be built from C to D.<br>Find the length of this fence, correct to the nearest metre.                              | 1 |
| (iii) | Starting at C posts are to be placed from C to D.<br>They will be placed at 6 metre intervals.<br>How many posts will be needed? | 1 |
| (iv)  | Posts cost \$25 each, and the other fencing materials required cost \$55/m, how much will it cost to construct this fence?       | 2 |
| (v)   | In the park is a water tank which is used for the toilet block.<br>Water flows into the tank at a rate of 2 L/min.               |   |
| (1)   | How much water will flow into the tank in 2 hours?   | 1 |
| (2)   | How long will it take for 1 000 L to flow into the tank?<br>Express your answer in hours and minutes.                            | 1 |

**Question 23 continues on page 12**

- (b) Calculate the height ( $h$  metres) of the tree in the diagram below, correct to the nearest metre.

2

All measurements are in metres.



- (c) George is a cabinet maker who works from home. He charges \$17 to fix chairs, \$42 to re-paint tables and \$65 to repair wardrobes.

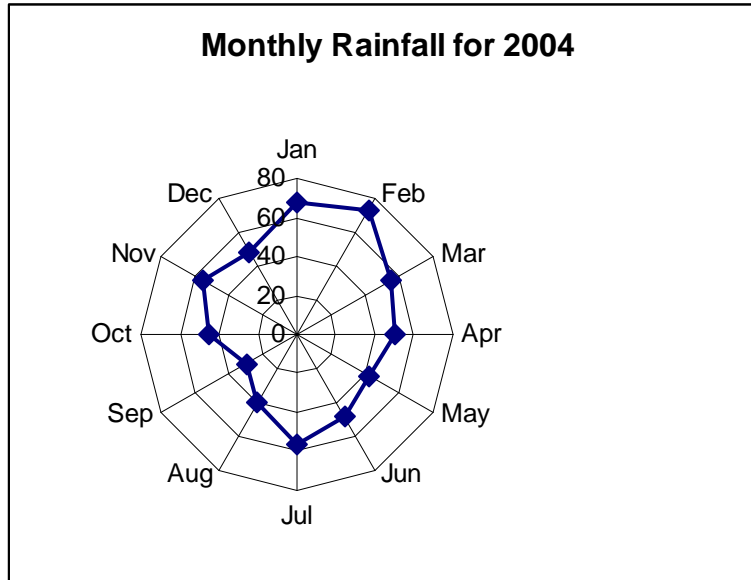
In one week he completes 7 chairs, 14 tables and 2 wardrobes.

- |       |   |   |
|-------|---|---|
| (i)   | Find his income for the week.   | 1 |
| (ii)  | If George worked for a total of 39 hours during the week, calculate his hourly rate of pay for that week. | 1 |
| (iii) | Calculate his profit for the week if his expenses were \$350.22.  | 1 |

**End of Question 23**

**Marks****Question 24 (13 marks) Use a SEPARATE sheet of paper.**

- (a) The radar chart below was constructed from data collected during the year 2004. The information relates to the average monthly rainfall, measured in mm, received in a NSW country town.



- (i) Which month had the highest average monthly rainfall? 1
- (ii) Approximately what was the average monthly rainfall in October? 1
- (iii) Briefly describe the rainfall pattern for this country town during 2004. 2
- (b) Solve the equation  $\frac{2x - 4}{3} = 10$  . 2

**Question 24 continues on page 14**

- (c) The marks in a recent Biology test are displayed in the stem-and-leaf plot below.

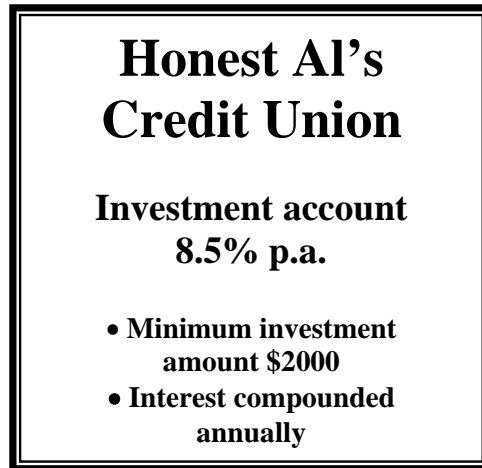
Stem	Leaf							
2	1	3	4	6				
3	5	6						
4	1	1	3	5	5	6	6	8
5	3	5	7	7	7	7		
6	1	4	4	5	5	6	7	
7	0	□						

- |       |   |   |
|-------|---|---|
| (i)   | One digit is missing. Given that the range of the marks is 51, determine the missing digit. | 1 |
| (ii)  | Calculate the highest and lowest marks.   | 1 |
| (iii) | Determine the median mark.  | 1 |
| (iv)  | Evaluate the upper and lower quartile marks.  | 1 |
| (v)   | Display the marks as a box-and-whisker plot.  | 3 |

**End of Question 24**

**Marks****Question 25 (13 marks)      Use a SEPARATE sheet of paper.**

- (a) Mario invests \$5 000 for 5 years  
in the account detailed below.



- |      |  |   |
|------|--|---|
| (i)  | Find the final balance of Mario's investment.                              | 2 |
| (ii) | Calculate the compounded interest that Mario will earn on this investment. | 1 |
- (b) A fish tank is in the shape of a rectangular prism. It has a removable lid.
- The tanks dimensions are 80 cm by 60 cm by 15 cm.
- |       |   |   |
|-------|---|---|
| (i)   | Find the total surface area of the tank.          | 2 |
| (ii)  | Find the volume of the tank in cubic centimetres. | 1 |
| (iii) | How many litres of water will the tank hold?      | 1 |

**Question 25 continues on page 16**

- (c) Julie selects a letter at random from the word **CABRAMATTA**.

Determine the probability that the letter picked is

- |       |                      |   |
|-------|----------------------|---|
| (i)   | the letter “A”.      | 1 |
| (ii)  | a consonant.         | 1 |
| (iii) | NOT an “A” or a “T”. | 1 |

- (d) The angle of depression from the top of a cliff 60 metres above sea level to a fishing boat is  $22^\circ$ .

- |      |   |   |
|------|---|---|
| (i)  | Draw a neat diagram to represent this information.                | 1 |
| (ii) | Find the distance of the fishing boat from the foot of the cliff. | 2 |

**End of Question 25**



**Marks****Question 26 (13 marks) Use a SEPARATE sheet of paper.**

- (a) Jim works part-time at the local hardware store,
- Tools R Us**
- .

His rates of pay are as follows:

Weekday rate	\$15 per hour
Saturday rate	Time-and-a-half
Sunday rate	Double time

His time sheet for last week is:

	<b>Start</b>	<b>Finish</b>	<b>Unpaid Break</b>
<b>Thursday</b>	5:30 pm	9:30 pm	0 minutes
<b>Friday</b>	9:00 am	1:30 pm	30 minutes
<b>Saturday</b>	8:00 am	2:00 pm	30 minutes
<b>Sunday</b>	8:00 am	2:00 pm	0 minutes

Calculate Jim's gross pay for last week.

4

- (b) The top line below represents a true length and the line under it represents the length as it would be shown on a scale diagram.



- (i) Calculate the scale being used. 1
- (ii) What true length is represented by a scaled length of 25 mm? 1

**Question 26 continues on page 18**

- (c) In 2003 the NSW Department of Fisheries captured, tagged and released 1 000 trout into Lake Eucumbene. In July 2004, a survey was undertaken and it found that of all the trout caught in July, 16% were tagged.  
Estimate the total population of trout in Lake Eucumbene for the month of July 2004. 2
- (d) (i) Simplify  $8 - 2t + 3(3t - 2)$ . 1
- (ii) The volume,  $V \text{ m}^3$ , of a square pyramid with a base area of  $A \text{ m}^2$  and a height of  $H \text{ m}$  can be found using
- $$V = \frac{1}{3}AH$$
- A pyramid in Mexico has a volume of  $168\,000 \text{ m}^3$  and a base area of  $8\,256 \text{ m}^2$ .  
What is the height of the pyramid? 2
- (e) Vinh mixes 1 litre of red paint with 5 litres of white paint to make pink paint.
- (i) What ratio of white to red paint does Vinh use? 1
- (ii) He needs to make 30 litres of pink paint.  
How many litres of white and red paint must he use? 1

**End of Question 26**

Marks

**Question 27 (13 marks) Use a SEPARATE sheet of paper.**

- (a) Anne is planning to buy a new mobile phone. She is comparing two telephone company plans.

<b>Plan 1</b>	
<b>Bestra</b>	♦ monthly access fee \$7 ♦ plus \$0.60 per call
<b>Plan 2</b>	
<b>4Tell</b>	♦ monthly access fee \$10 ♦ plus \$0.25 per call

The costs  $C$  for each of these plans can be represented by the following formulas, where  $n$  stands for the number of phone calls made during a month:

**Bestra**       $C = 0.60n + 7$

**4Tell**       $C = 0.25n + 10$

Anne decided to graph these formulas so that she could easily compare them. She used the tables below to graph each formula.

**Bestra**       $C = 0.60n + 7$

$n$	0	10	20
$C$	7	13	

**4Tell**       $C = 0.25n + 10$

$n$	0	10	20
$C$		12.5	15

- |       |   |   |
|-------|---|---|
| (i)   | Copy and complete each table on your answer sheet.  | 1 |
| (ii)  | Graph both formulas on the same set of axes.<br>Use values for $n$ from 0 to 20, and for $C$ from 0 to 22.  | 4 |
| (iii) | If Anne usually makes 14 calls per month, which plan is the better one for her?                             | 1 |
| (iv)  | For what number of calls per month do both plans charge the same?   | 1 |
| (v)   | What plan would you recommend Anne to take up?<br>You must justify your choice with mathematical reasoning. | 2 |

**Question 27 continues on page 20**

- (b) The eye colour of students at Surfside High were recorded and displayed in a frequency distribution table.

Eye colour	No. of students
Brown	27
Blue	33
Green	22
Other	18

- (i) How many students were involved with this survey? 1
- (ii) What is the modal eye colour? 1
- (iii) Describe the type of data set collected here. 1
- (iv) What is the best measure of central tendency to use here, the mean, mode or median?  
**Justify your answer.** 1

**End of Question 27**

**Marks****Question 28 (13 marks) Use a SEPARATE sheet of paper.**

- (a) Distances in space are measured in light years. A light year is the distance that light travels in 1 year and is equal to  $9.46 \times 10^{12}$  kilometres.

Express this distance in normal form.

1

**The following table is needed for part (b)****Personal Income Tax Rates**

<i><b>Taxable income</b></i>	<i><b>Tax on this income (2004)</b></i>
\$1–\$6000	Nil
\$6001–\$20 000	17 cents for each \$1 over \$6 000
\$20 001–\$50 000	\$2 380 + 30 cents for each \$1 over \$20 000
\$50 001–\$60 000	\$11 380 + 42 cents for each \$1 over \$50 000
\$60 001 and over	\$15 580 + 47 cents for each \$1 over \$60 000

- (b) Mymen earned \$53 800 in the last financial year. She is claiming \$876.50 in work related expenses, \$250 in union fees, and \$65 in “other” deductions.

- (i) Calculate her taxable income, correct to the nearest dollar.

1

- (ii) Calculate the amount of tax that she must pay.

2

- (iii) Mymen paid \$9246.04 in PAYG tax throughout the year.

Will she receive a tax refund or have a tax debt?  
How much?

2

**Question 28 continues on page 22**

- (c) Ruby walked for 10 km on a bearing of  $155^\circ$  from her house.
- (i) Draw a clearly labelled sketch of this information. 1
  - (ii) How far South is she from her house? 2
  - (iii) What is the bearing of her house from her current position? 2
- (d) (i) There is a 9% chance of it snowing tomorrow.  
What is the probability that it will NOT snow tomorrow? 1
- (ii) A poker machine has 4 wheels, each with 15 symbols.  
How many possible combinations are there? 1

**End of Paper**

# General Mathematics – Formulae Sheet

## Area of an annulus

$$A = \pi(R^2 - r^2)$$

$R$  = radius of outer circle

$r$  = radius of inner circle

## Area of an ellipse

$$A = \pi ab$$

$a$  = length of semi – major axis

$b$  = length of semi – minor axis

## Area of a sector

$$A = \frac{\theta}{360} \pi r^2$$

$\theta$  = number of degrees in central angle

## Arc length of a circle

$$l = \frac{\theta}{360} 2\pi r$$

$\theta$  = number of degrees in central angle

## Simpson's rule for area approximation

$$A \approx \frac{h}{3} (d_f + 4d_m + d_l)$$

$h$  = distance between successive measurements

$d_f$  = first measurement

$d_m$  = middle measurement

$d_l$  = last measurement

## Surface area

Sphere

$$A = 4\pi r^2$$

Closed cylinder

$$A = 2\pi rh + 2\pi r^2$$

$r$  = radius

$h$  = perpendicular height

## Volume

Cone

$$V = \frac{1}{3} \pi r^2 h$$

Cylinder

$$V = \pi r^2 h$$

Pyramid

$$V = \frac{1}{3} Ah$$

Sphere

$$V = \frac{4}{3} \pi r^3$$

$r$  = radius

$A$  = area of base

$h$  = perpendicular height

## Sine rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

## Area of a triangle

$$A = \frac{1}{2} ab \sin C$$

## Cosine rule

$$c^2 = a^2 + b^2 - 2ab \cos C$$

or

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

## General Mathematics – Formulae Sheet

### Simple interest

$$I = P r n$$

$P$  = initial quantity

$r$  = percentage interest rate per period,  
expressed as a decimal

$n$  = number of periods

### Compound interest

$$A = P(1 + r)^n$$

$A$  = final balance

$P$  = initial quantity

$n$  = number of compounding periods

$r$  = percentage interest rate per compounding  
period, expressed as a decimal

### Future value (A) of an annuity

$$A = M \left\{ \frac{(1+r)^n - 1}{r} \right\}$$

$M$  = contribution per period,  
paid at the end of the period

### Present value (N) of an annuity

$$N = M \left\{ \frac{(1+r)^n - 1}{r(1 + r)^n} \right\}$$

or

$$N = \frac{A}{(1 + r)^n}$$

### Straight-line formula for depreciation

$$S = V_0 - Dn$$

$S$  = salvage value of asset after  $n$  periods

$V_0$  = purchase price of the asset

$D$  = amount of depreciation apportioned  
per period

$n$  = number of periods

### Declining balance formula for depreciation

$$S = V_0 (1 - r)^n$$

$S$  = salvage value of asset after  $n$  periods

$r$  = percentage interest rate per period,  
expressed as a decimal

### Mean of a sample

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{\sum fx}{\sum f}$$

$\bar{x}$  = mean

$x$  = individual score

$n$  = number of scores

$f$  = frequency

### Formula for a z-score

$$z = \frac{x - \bar{x}}{s}$$

$s$  = standard deviation

### Gradient of a straight line

$$m = \frac{\text{vertical change in position}}{\text{horizontal change in position}}$$

### Gradient-intercept form of a straight

line

$$y = mx + b$$

$m$  = gradient

$b$  = y-intercept

### Probability of an event

The probability of an event where  
outcomes are equally likely is given by:

$$P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$$